35036

BT–5 / D-19
HEAT TRANSFER
Paper–ME–305 E

Time allowed : 3 hours]   *[Maximum marks : 100*

Note :- Attempt any five questions, selecting atleast one question from each unit.

Unit–I

1. (a) Enumerate the basic laws which govern heat transfer.   4

    (b) Explain briefly the various modes of heat transfer.   6

    (c) Explain in detail electrical ancology heat conduction.   10

2. (a) Derive general heat conduction equation in cylindrical coordinates.   10

    (b) The inner surface of a plane brick wall is at 50°C and the outer surface is at 30°C. Calculate the rate of heat transfer rate per m² of surface area of the wall, which is 250 mm thick. The thermal conductivity of the brick is 0.52 w/m°C.   10

Unit–II

3. (a) What is dimensional analysis? State its uses.   5

    (b) Discuss in brief the concept of boundary layer. Also differentiate hydrodynamic and thermal boundary layer.   8

    (c) Write a technical note on "Exact solution for laminar flow over an isothermal plate using similarity transformation".   7

(2)

4. (a) Derive momentum equation for hydrodynamic boundary layer over a flat plate.   10

    (b) Air at 30°C and at atmospheric pressure flows over a flat plate at a velocity of 1.5 m/s. If the length of the plate is 2 m and is maintained at 90°C, calculate the heat transfer rate per unit width using (i) exact and (ii) approximate method.   10

Unit–III

5. (a) Discuss in brief 'Theories of thermal radiation'.   10

    (b) Write short notes on Lambert's and stefan Boltzman laws.   10

6. (a) Define the terms: absorptivity reflectivity and transmitting of radiation.   8

    (b) Assuming the sun to be a black body emitting radiation with maximum intensity at λ =0.5 μm, calculate the surface temperature of the sun and the heat flux at its surface.   12

Unit–IV

7. (a) Derive an expression of logarithmic mean temperature difference for counter flow heat exchangers.   10

    (b) What do you mean by 'fouling' in heat exchangers?   5

    (c) Write a short note on 'heat exchanger effectiveness'.   5

8. Derive expressions for effectiveness by NTU method for the following cases: 20

    (i) Parallel flow

    (ii) Counter flow heat exchangers.

35036